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DEVELOPMENT OF ICT EDUCATIONAL SOFTWARE FOR PERCEPTIONAL TRAINING OF MANDARIN CHINESE NASAL CODAS

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Abstract

We have been doing research on an effective training method for Japanese speakers to be able to discriminate between the Mandarin Chinese nasal codas “-n” and “-ng”, which is one of the most difficult phonemic contrasts for Japanese speakers. Few research studies have focused on a solution specifically for Japanese learners of Mandarin Chinese to be able to discriminate between “-n” and “-ng”. Based on this background, we are working on developing ICT (Information and Communication Technology) educational software for perceptional training of Mandarin Chinese nasal codas. In this paper, we introduce our perceptional training system, and then, describe the results of the preliminary training tests with and without our training system. By observing the participants’ behaviors while training with the system, and their opinions from the questionnaire, we found that there were no problems in system usability.

Keywords: Japanese speaker, nasal codas, Mandarin Chinese, training software.

1 INTRODUCTION

Japanese learners of English generally have difficulty differentiating the phonemes /r/ and /l/, even after years of experience with English [1]. There are a number of researches on training Japanese speakers to identify English /r/ and /l/. Logan et al. [1] made use of a training procedure that emphasized variability among stimuli and proved this training method was effective. Especially, they made several changes on previous researches. For example, they used a two-alternative forced-choice identification task during training, and natural speech tokens instead of synthesized speech. This method would be useful for training on other phonemic contrasts in different languages, however, such studies are not enough.

Nasal codas “-n” and “-ng” are one pair of the most difficult phonemic contrasts in Mandarin Chinese. Stevens [2] indicates that nasal consonants are produced by forming a complete closure at some point along the length of the oral region of the vocal tract. Mou [3] indicates that nasals in both English and Mandarin Chinese are specified by the same features. The phoneme /m/ is produced with a closure at the lips, /n/ is produced with a constriction made with the tongue blade and /ŋ/ is produced with a constriction made with the tongue body. In modern Mandarin Chinese, [m] does not occur at the final position of a syllable. As a result, there are two types of nasal codas in Mandarin Chinese, “n[n]” and “ng[ŋ]”. As with nasal codas, they only occur with vowels, and cannot make a syllable by themselves, for example, “in” and “bang”. In Mandarin Chinese, two word utterances which differ only in nasal codas will be recognized as different utterances. In some languages, regardless of the pronunciation of nasal codas, word utterances will be recognized as the same word. In Japanese, consonants do not usually occur in the syllable-final position, only the mora nasal /N/ and the mora obstruent /Q/ can occur in this position. The mora nasal /N/ can only occur in the syllable-final position, and the articulation is different depending on the following consonant [4][5]. For instance, /N/ becomes [m] before a bilabial consonant, [n] before an alveolar consonant, and [ŋ] before a velar consonant. [m], [n] and [ŋ] are all allophones of /N/. That is, in spite of the different articulations due to a following consonant, the meaning of such utterances never changes. As a result, Japanese native speakers do not pay attention to the differences of the syllabic nasal codas. It is difficult for Japanese speakers to distinguish the nasal codas “-n” and “-ng” in Mandarin Chinese.

2 PREVIOUS RESEARCHES

Previous researches focused on the characteristics showed in the perception of nasal codas. However, few research studies have focused on the solution specifically for Japanese learners of

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Mandarin Chinese to be able to discriminate between “-n” and “-ng”. Wang [6] studied the relationship between the perception and production of nasal codas by Japanese learners of Mandarin Chinese. Kanamori [7] analyzed the speech characteristic of Chinese learners in the case of nasalized vowel “an” and “ang”. Ren [8] investigated the error patterns of nasal codas in perception and how tones influenced the identification accuracy of nasal codas. We also made an investigation of Japanese speakers in Yang, Nanjo and Dantsuji [9], and indicated that even in cases in which the time of study was extended, Japanese speakers did not make considerable improvement in perception. The identification accuracy of nasal codas of Mandarin Chinese by Japanese speakers was 60.7%. The discrimination of “-n” and “-ng” is quite difficult for Japanese speakers. They did not show the same trend in perception with the southern native speakers of China who do not differentiate Mandarin Chinese nasal codas either. As a result, it is necessary to make a training software for Japanese speakers especially.

3 TRAINING SOFTWARE

Based on the above, it is necessary to find an effective way to help Japanese speakers distinguish the two nasal codas in perception. We made a training software which keeps users listening to Chinese syllables ending with a nasal coda. The training software we have developed runs on the Windows operating system as a GUI (Graphical User Interface) program. The interface modes of the training software are shown in Fig.1 to Fig.5. Users are instructed to listen to a Chinese syllable and to identify the word final consonant in each item. A two-alternative forced-choice identification task was applied to this software. Utterances of monosyllables made by two female native speakers of Mandarin Chinese were included in the software. There are two modes; a test mode and a practice mode (Fig.1). Both modes allow users only to click buttons, and the sounds in both modes can be replayed as many times as the users need. In a test mode (Fig.2), users are first asked to click the “paly-sound” button, then to listen to a Chinese syllable which ends either in “n” or “ng”,and finally, to select an answer by clicking a button displaying either “n” or “ng”. After the answer selection, users proceed to the next test item. A test-set in this test mode consists of 10 items, and the 10 items are different each time. At the end of the test mode, the number of correct answers is displayed. In the practice mode (Fig.3, 4 and 5), users are also required to click “play-sound” button and to select an answer. A feedback to understand whether the sound is “-n” or “-ng” is displayed after each selection (Fig.4). Users can proceed to the next or previous training item. It is possible to practice the same training item again. There are 50 items in the practice mode, at the end of the practice mode, users can also check the number of correct answers (Fig.5). Users can end the practice when they want to stop. The process of each training session is shown in Fig.6.

Fig.1 The interface of the software

Fig.2 The interface of the test mode

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Fig.3 The interface of the practice mode

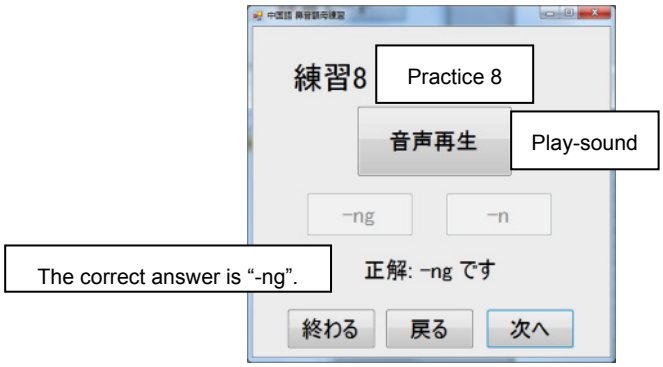

Fig.4 The interface of answer display

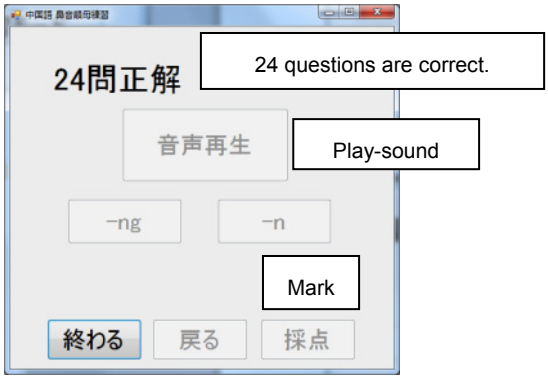

Fig.5 The interface of marking

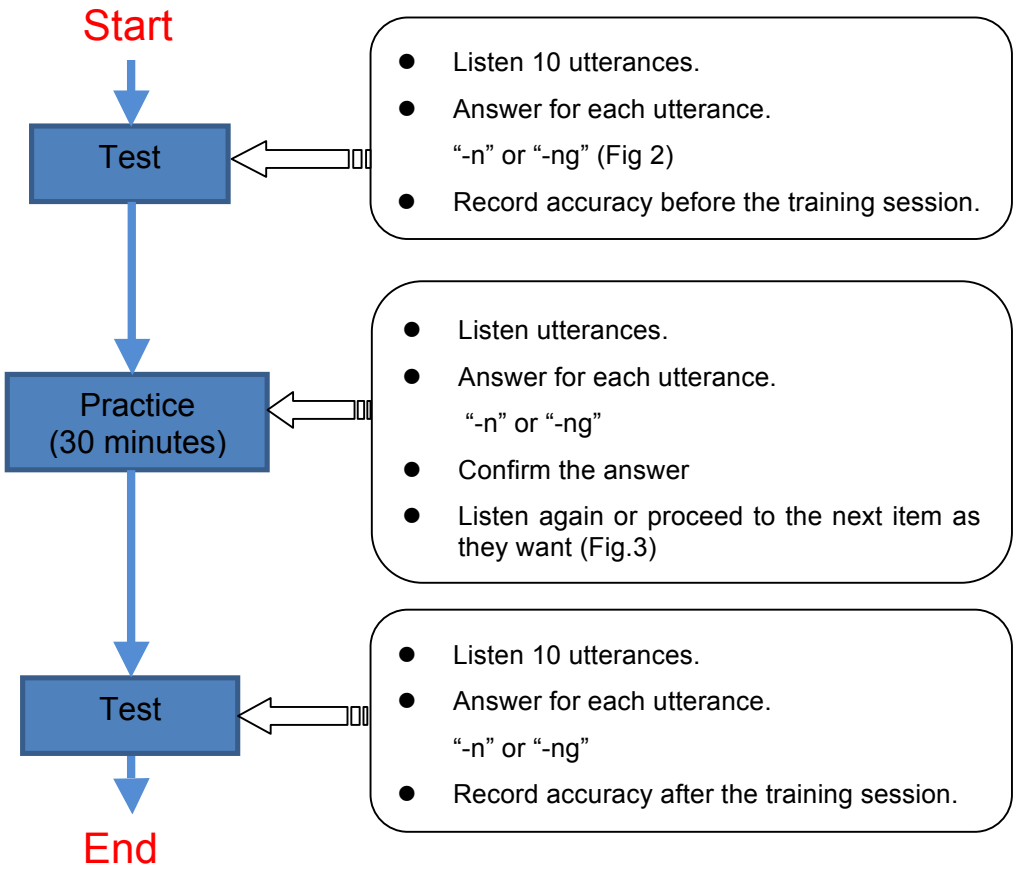

Fig.6 The process of each training session

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4 VERIFICATION OF THE TRAINING SOFTWARE

4.1 Verification

To verify the usability of the training software, we asked some Japanese speakers to train their perceiving ability discriminating “-n” and “-ng”. Participants were undergraduate students who had been learning Mandarin Chinese as a foreign language at a public university in Japan for about ten months. At the beginning of the verification, we conducted an identification test with 150 utterances which are produced by different native speakers. Participants were divided into two groups: an experimental group and a control group. The participants assigned to the experimental group were required to come to the classroom and train themselves with the software. Each training session lasted 30 minutes. The participants in the control group were only required to take part in the identification tests. The number of participants in the experimental group and the control group were 14 and 28 respectively. An instruction was given in Japanese, the participants’ mother tongue. After the whole training, we conducted the “-n” and “-ng” identification test again as the post test and asked them to fill in a questionnaire.

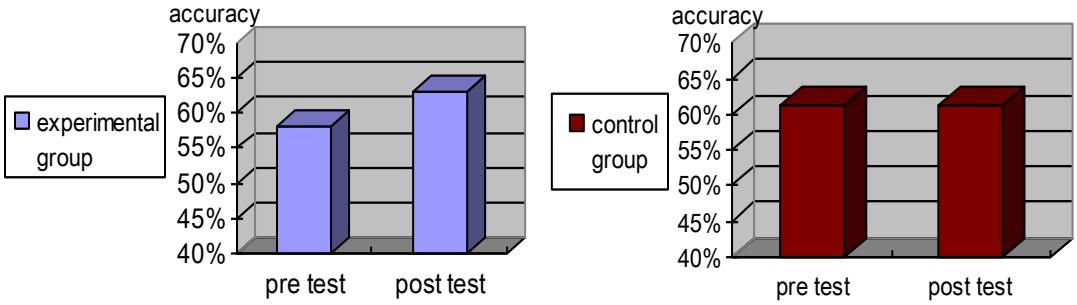

Fig.7 “-n” and “-ng” identification accuracy for the experimental group and the control group

The results of the two groups are given in Fig.7. The identification accuracy of nasal codas in the experimental group improved from 58.2% to 63.0%, while the identification accuracy in the control group remained the same.

4.2 Discussion

By observing the participants’ behaviors while training with the system, and their opinions from the questionnaire, we found that there were no problems in system usability. In the questionnaire, all the participants who used this training software acknowledged that they had made an improvement of perceiving “-n” and “-ng” by using this training software. During the 34 sessions of practice by the participants in experimental groups, 20 times of the training were effective because the participants made progress after using the practice mode. The scores of the test mode remained the same in 6 times of the training.

However, there are some improvements to be made with the software. For example, we asked the participants to come to a classroom and train themselves with the software which we had installed on a computer. Some participants thought it was too much trouble to go to the designated classroom. As a result, it was difficult to recruit participants for the experiment. To attract more participants, we are considering an easier way for participants to take part. Moreover, some participants could not concentrate and felt sleepy due to the long duration of the training (30 minutes), so the duration should also be adjusted.

5 CONCLUSION

In this paper, we developed a training software which aids Japanese speakers in discriminating nasal codas “-n” and “-ng” in Mandarin Chinese. We introduced the training system and verified its usability. The results showed that the participants who used the software obtained a higher score in the identification test than the one before training, while the scores of the participants without the training software remained the same. We are planning to make some improvements and then verify the effect of the training software by conducting a large-scale user test. This software for perceptional training

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can be used not only in Mandarin Chinese teaching, but can be applied to phonetic training for any language in which there is no discrimination between “-n” and “-ng” as well.

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REFERENCES

[1] J. S.Logan, S. E.Lively, and D. B.Pisoni, Training Japanese listeners to identify English /r/ and /l/: A first report. *Journal of the Acoustical Society of America*, vol.89, no.2, pp.874-886, 1991.

[2] K.N. Stevens, *Acoustic phonetics*, Boston, The MIT Press, 1998.

[3] X. Mou, Nasal codas in Standard Chinese: a study in the framework of the distinctive feature theory, Doctoral dissertation, Massachusetts Institute of Technology, 2006.

[4] S. Hatori 服部四郎 , *onseigaku* 音声学, Tokyo, Iwanami shoten 岩波書店, 1984.(in Japanese)

[5] S. Hokama 外間守善 and M. Sagawa 佐川誠義, *Nihon gengogaku yōsetsu* 日本言語学要説, Tokyo, Asakura shoten 朝倉書店, 1984.(in Japanese)

[6] Y.Wang, An experimental study on the perceptional and production of nasal codas by Japanese learners of Chinese Putonghua, *Chinese teaching in the world,* vol.60, pp.47-60, 2002.

[7] Y. Kanamori, K. Itoh and N. Liu. The characteristics of Chinese speech for Japanese utters-The case of vowel part of ‘an’ and ‘ang’-, *Technical Report of IEICE*, DSP2003-104, SP2003-99, pp.29-34, 2003.

[8] X.Ren 任星, nihonjin gakushūsha ni yoru chūgokugo bion inbono chikaku oyobi seichō to no kanren 日本人学習者による中国語鼻音韻母の知覚および声調との関連, *Journal of the Phonetic Society of Japan*,vol.10,no.7, pp.201-206,2006.(in Japanese)

[9] R.Yang 楊蕊寧,H.Nanjo 南條浩輝 and M.Danstuji 壇辻正剛, nihonjin gakushūsha niyoru tyūgokugo bion inbono tikaku ni okeru tokuchō-senkō shiin ga haretsu shiin no baai- 日本人学習者による中国語鼻音韻母の知覚における特徴―先行子音が破裂子音の場合― *Journal of the Japan Society for Speech Science,*vol.17, pp.115-132,2016.(in Japanese)